# 1.8 Use of technology to solve systems of linear equations and polynomial equations\_P\_2

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

## Markscheme

(amount taken in the 7th day):      ***(A1)***

**Note:** Accept . The equations do not need to be simplified. They should be given in terms of  and  for the marks to be awarded.

***[1 mark]***

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

## Markscheme

(amount taken in the 11th day):      ***(A1)***

**Note:** Accept . The equations do not need to be simplified. They should be given in terms of  and  for the marks to be awarded.

***[1 mark]***

**1c.** *[2 marks]*

## Markscheme

( =) 9     ***(A1)*(ft)**

( =) 2     ***(A1)*(ft)**

**Note:** Follow through from part (a), but only if values are positive and  < 21.

***[2 marks]***

**1d.** *[3 marks]*

## Markscheme

      ***(M1)(A1)*(ft)**

**Note:** Award ***(M1)*** for substitution in the sum of an arithmetic sequence formula; ***(A1)*(ft)** for their correct substitution.

1140  (mg)       ***(A1)*(ft)*(G3)***

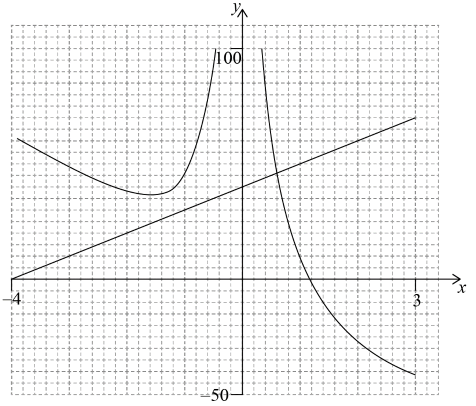
**Note:** Follow through from their  and  from part (b).

***[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.

***(A1)(A1)(A1)(A1)***

**Note:** Award ***(A1)*** for axis labels and some indication of scale; accept *y* or *f*(*x*).

Use of graph paper is not required. If no scale is given, assume the given window for zero and minimum point.

Award ***(A1)*** for smooth curve with correct general shape.

Award ***(A1)*** for *x*-intercept closer to *y*-axis than to end of sketch.

Award ***(A1)*** for correct local minimum with *x*-coordinate closer to *y*-axis than end of sketch and *y*-coordinate less than half way to top of sketch.

Award at most ***(A1)(A0)(A1)(A1)*** if the sketch intersects the *y*-axis or if the sketch curves away from the *y*-axis as *x* approaches zero.

***[4 marks]***

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

## Markscheme

1.19  (1.19055…)  ***(A1)***

**Note:** Accept an answer of (1.19, 0).

Do not follow through from an incorrect sketch.

***[1 mark]***

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

## Markscheme

(−1.5, 36)      ***(A1)(A1)***

**Note:** Award ***(A0)(A1)*** if parentheses are omitted.

Accept *x* = −1.5, *y* = 36.

***[2 marks]***

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

## Markscheme

*y* = −9.25*x* + 20.3  (*y* = −9.25*x* + 20.25)      ***(A1)(A1)***

**Note:** Award ***(A1)*** for −9.25*x*, award ***(A1)*** for +20.25, award a maximum of ***(A0)(A1)*** if answer is not an equation.

***[2 marks]***

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

## Markscheme

correct line, *y* = 10*x* + 40, seen on sketch     ***(A1)(A1)***

**Note:** Award ***(A1)*** for straight line with positive gradient, award ***(A1)*** for *x*-intercept and *y*-intercept in approximately the correct positions. Award at most ***(A0)(A1)*** if ruler not used. If the straight line is drawn on different axes to part (a), award at most ***(A0)(A1)***.

***[2 marks]***

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

## Markscheme

0.684  (0.68362…)      ***(G2)***

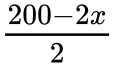
**Note:** Award at most ***(G1)*** if *y*-value (46.8) is also given. Award ***(G1)*** for 0.683.

***[2 marks]***

**3a.** *[1 mark]*

## Markscheme

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

 (or equivalent)     ***(M1)***

**OR**

 (or equivalent)     ***(M1)***

**Note:**     Award ***(M1)*** for a correct expression leading to  (the  does not need to be seen). The 200 must be seen for the ***(M1)*** to be awarded. Do not accept  substituted in the perimeter of the rectangle formula.

     ***(AG)***

***[1 mark]***

**3b.** *[1 mark]*

## Markscheme

**OR** (or equivalent)     ***(A1)***

***[1 mark]***

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

## Markscheme

**METHOD 1**

use of sum of roots     ***(M1)***



     ***A1***

use of product of roots     ***M1***

product is      ***A1***

     ***A1***

**Note:** The line above can be awarded if they have used their value of .

     ***A1***

**METHOD 2**

     ***M1A1***

compare constant terms or coefficients of      ***(M1)***



     ***A1***

     ***A1A1***

***[6 marks]***

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

## Markscheme

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

**METHOD 1**

substituting

     ***(A1)***

equating real or imaginary parts     ***(M1)***

     ***A1***

     ***A1***

**METHOD 2**

other root is      ***(A1)***

considering either the sum or product of roots or multiplying factors     ***(M1)***

 (sum of roots) so      ***A1***

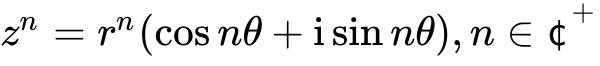
 (product of roots)     ***A1***

***[4 marks]***

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

## Markscheme

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

let  be the proposition 

let 



 is true     ***R1***

assume true for      ***M1***

**Note:**Only award the ***M1*** if truth is assumed.

now show  true implies  also true

     ***M1***



     ***A1***

     ***A1***

 is true     ***A1***

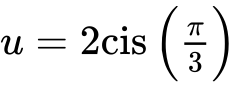
 true implies  true and  is true, therefore by mathematical induction statement is true for      ***R1***

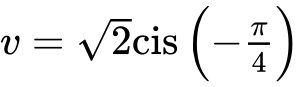
**Note:**     Only award the final ***R1*** if the first 4 marks have been awarded.

***[7 marks]***

**6b.** *[4 marks]*

## Markscheme

(i)          ***A1***

     ***A1***

**Notes:**     Accept 3 sf answers only. Accept equivalent forms.

     Accept  and .

(ii)     

     ***(M1)***

     ***A1***

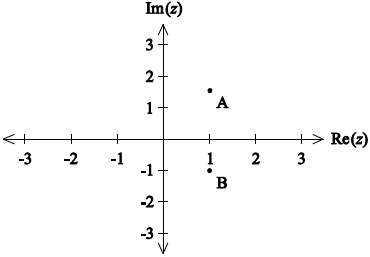
**Notes:**     Award ***(M1)*** for an attempt to find  and .

     Accept equivalent forms.

***[4 marks]***

**6c.** *[1 mark]*

## Markscheme

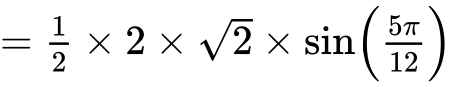
     ***A1***

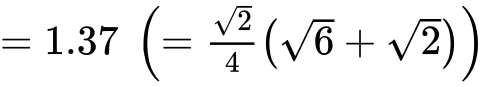
**Note:**     Award **A1** if A or  and B or  are in their correct quadrants, are aligned vertically and it is clear that .

***[1 mark]***

**6d.** *[3 marks]*

## Markscheme

Area      ***M1A1***

     ***A1***

**Notes:**     Award ***M1A0A0*** for using .

***[3 marks]***

Printed for SANSKAR SCHOOL

© International Baccalaureate Organization 2019

International Baccalaureate® - Baccalauréat International® - Bachillerato Internacional®