# 1.2 arithmetic sequences and series\_P\_1

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

## Markscheme

( =) − 250             ***A1***

***[1 mark]***

**1b.** *[2 marks]*

## Markscheme

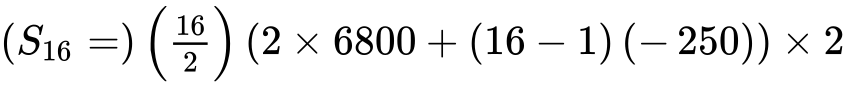
           ***M1***

(¥)3050           ***A1***

***[2 marks]***

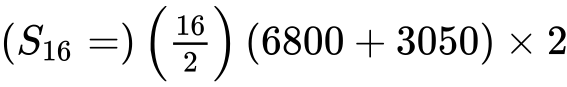
**1c.** *[3 marks]*

## Markscheme

          ***M1M1***

**Note:** Award ***M1***for correct substitution into arithmetic series formula.  
Award ***M1***for multiplication by 2 seen.

***OR***

         ***M1M1***

**Note:** Award ***M1***for correct substitution into arithmetic series formula.  
Award ***M1***for multiplication by 2 seen.

(¥)158 000 (157 600)          ***A1***

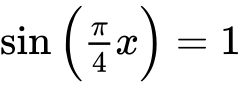
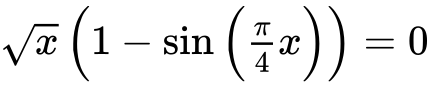
***[3 marks]***

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

## Markscheme

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

correct working        ***(A1)***

*eg*  ,  

  (seen anywhere)        ***(A1)***

correct working (ignore additional values)        ***(A1)***

*eg*   ,  

 = 2, 10       ***A1A1    N1N1***

***[5 marks]***

**2b.** *[4 marks]*

## Markscheme

correct working        ***(A1)***

*eg*  ,  ,  

valid approach       ***(M1)***

*eg*   ,  ,   = common difference

 = −6,  = 8  (accept )       ***A1A1    N2N2***

***[4 marks]***

**2c.** *[4 marks]*

## Markscheme

valid approach        ***(M1)***

*eg*first intersection at , 

correct working        ***A1***

*eg*,  , 

P(154, )   (accept  and )      ***A1A1    N3***

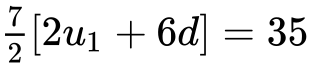
***[4 marks]***

**3.** *[4 marks]*

## Markscheme

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

attempting to form two equations involving  and ***M1***

 and 



       ***A1***

**Note:** Award ***A1*** for any two correct equations

attempting to solve their equations:***M1***

,         ***A1***

***[4 marks]***

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

## Markscheme

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

correct working      ***(A1)***

*eg*−5 + (8 − 1)(3)

*u* = 16     ***A1 N2***

***[2 marks]***

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

## Markscheme

correct substitution into *u* formula       ***(A1)***

eg   −5 + 3(*n* − 1),  3*n* − 8

correct equation       ***(A1)***

eg   −5 + 3(*n* − 1) = 67,  3*n* − 8 = 67,  3(*n* − 1) = 72

correct working ***(A1)***

*eg*3*n* = 75,  *n* − 1 = 24

n = 25      ***A1 N3***

***[4 marks]***

**5a.** *[1 mark]*

## Markscheme

*w*      ***(A1) (C1)***

***[1 mark]***

**5b.** *[1 mark]*

## Markscheme

*u*      ***(A1) (C1)***

***[1 mark]***

**5c.** *[2 marks]*

## Markscheme

10 (2)      ***(M1)***

**Note:** Award ***(M1)*** for correct substitutions into geometric sequence formula.

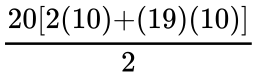
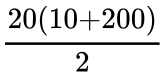
= 10 240      ***(A1)*(ft) *(C2)***

**Note:** Exact answer only. Accuracy rules do not apply in this question part; do not accept the 3 sf answer of 10 200.

***[2 marks]***

**5d.** *[2 marks]*

## Markscheme

  **OR**       ***(M1)***

**Note:** Award ***(M1)*** for correct substitutions into arithmetic series formula.

= 2100      ***(A1)*(ft) *(C2)***

***[2 marks]***

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

## Markscheme

5*d* = 46 − 21  **OR**  *u* + 2*d* = 21  and  *u* + 7*d* = 46     ***(M1)***

**Note:** Award ***(M1)*** for a correct equation in *d* or for two correct equations in *u* and *d*.

(*d =*) 5 (kg)      ***(A1) (C2)***

***[2 marks]***

**6b.** *[2 marks]*

## Markscheme

*u* + 2 × 5 = 21    ***(M1)***

***OR***

*u* + 7 × 5 = 46    ***(M1)***

**Note:** Award ***(M1)*** for substitution of their *d* into either of the two equations.

(*u*=) 11 (kg)     ***(A1)*(ft) *(C2)***

**Note:** Follow through from part (a)(i).

***[2 marks]***

**6c.** *[2 marks]*

## Markscheme

     ***(M1)***

**Note:** Award ***(M1)*** for correct substitution into arithmetic series formula.

= 462 (kg)     ***(A1)*(ft) *(C2)***

**Note:** Follow through from parts (a) and (b).

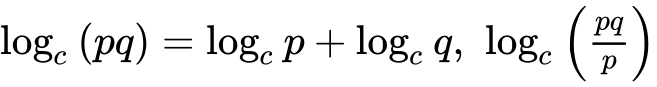
***[2 marks]***

**7a.** *[2 marks]*

## Markscheme

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

valid approach involving addition or subtraction       ***M1***  
*eg*  

correct application of log law      ***A1***  
*eg*  

    ***AG N0***

***[2 marks]***

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

## Markscheme

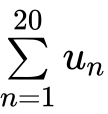
**METHOD 1** (finding  and *d*)

recognizing  (seen anywhere)      ***(A1)***

attempt to find  or *d* using      ***(M1)***  
eg  , , correct value of  or *d*

 = 2, *d* = 3 (seen anywhere)      ***(A1)(A1)***

correct working    ***(A1)***  
*eg*  

 = 610     ***A1 N2***

**METHOD 2** (expressing *S* in terms of *c*)

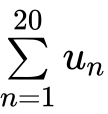
recognizing  (seen anywhere)      ***(A1)***

correct expression for *S* in terms of *c*      ***(A1)***  
*eg*  

  (seen anywhere)     ***(A1)(A1)***

correct working      ***(A1)***

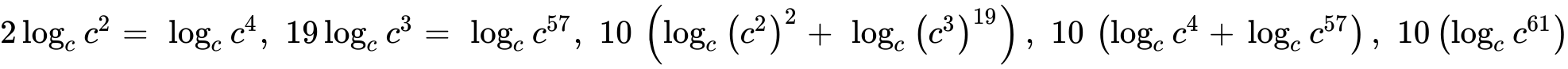
*eg*  

 = 610     ***A1 N2***

**METHOD 3** (expressing *S* in terms of *c*)

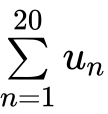
recognizing  (seen anywhere)      ***(A1)***

correct expression for *S* in terms of *c*      ***(A1)***  
*eg*  

correct application of log law     ***(A1)***  
eg  

correct application of definition of log      ***(A1)***  
eg  

correct working     ***(A1)***  
eg  

 = 610     ***A1 N2***

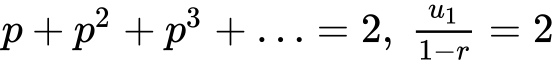
***[6 marks]***

**8.** *[5 marks]*

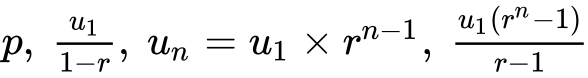
## Markscheme

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

infinite sum of segments is 2 (seen anywhere)     ***(A1)***

*eg*

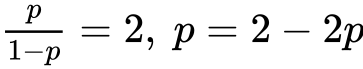
recognizing GP     ***(M1)***

*eg*ratio is 

correct substitution into  formula (may be seen in equation)     ***A1***

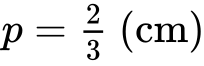
*eg*

correct equation     ***(A1)***

*eg*

correct working leading to answer     ***A1***

*eg*

     ***AG     N0***

***[5 marks]***

**9a.** *[2 marks]*

## Markscheme

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

subtracting terms     ***(M1)***

*eg*

     ***A1     N2***

***[2 marks]***

**9b.** *[2 marks]*

## Markscheme

correct substitution into formula     ***(A1)***

*eg*

     ***A1     N2***

***[2 marks]***

**9c.** *[2 marks]*

## Markscheme

correct substitution into formula for sum     ***(A1)***

*eg*

     ***A1     N2***

***[2 marks]***

**10a.** *[3 marks]*

## Markscheme

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

     ***(M1)(A1)***

**Note:**     Award ***(M1)*** for substituted arithmetic sequence formula, ***(A1)*** for correct substitutions.

     ***(A1)***     ***(C3)***

**Note:**     Units are not required.

***[3 marks]***

**10b.** *[3 marks]*

## Markscheme

     ***(M1)(A1)*(ft)**

**Note:**     Award ***(M1)*** for substituted arithmetic sequence formula , accept an equation, ***(A1)*** for correct substitutions.

     ***(A1)*(ft)*****(C3)***

**Note:**     Follow through from their 27 in part (a). The answer must be an integer and rounded down.

***[3 marks]***

**11a.** *[2 marks]*

## Markscheme

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

attempt to subtract terms     ***(M1)***

*eg*

     ***A1***     ***N2***

***[2 marks]***

**11b.** *[2 marks]*

## Markscheme

correct approach     ***(A1)***

*eg*

     ***A1***     ***N2***

***[2 marks]***

**11c.** *[2 marks]*

## Markscheme

correct substitution into sum     ***(A1)***

*eg*

     ***A1***     ***N2***

***[2 marks]***

**12a.** *[3 marks]*

## Markscheme

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

     ***(M1)(A1)***

**Note:**     Award ***(M1)*** for substitution into the formula of the th term of an arithmetic sequence, ***(A1)*** for correct substitution.

     ***(A1)***     ***(C3)***

***[3 marks]***

**12b.** *[3 marks]*

## Markscheme

**OR**     ***(M1)(A1)*(ft)**

**Notes:**     Award ***(M1)*** for substitution into the sum of the first  terms of an arithmetic sequence formula, ***(A1)*(ft)** for their correct substitution, consistent with part (a).

924     ***(A1)*(ft)**     ***(C3)***

**Note:**     Follow through from part (a).

***[3 marks]***

**13a.** *[4 marks]*

## Markscheme

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

use of      ***M1***

 (or equivalent)     ***M1A1***

     ***A1***

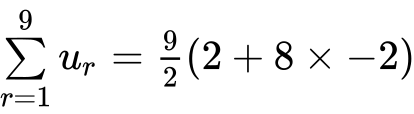
***[4 marks]***

**13b.** *[3 marks]*

## Markscheme



     ***(A1)***

     ***(M1)***

     ***A1***

***[3 marks]***

**14a.** *[4 marks]*

## Markscheme

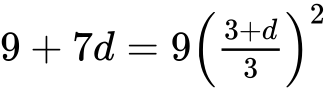
\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

**EITHER**

the first three terms of the geometric sequence are ,  and      ***(M1)***

 and      ***(A1)***

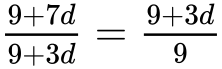
attempt to solve simultaneously     ***(M1)***



**OR**

the ,  and  terms of the arithmetic sequence are

     ***(M1)***

     ***(A1)***

attempt to solve     ***(M1)***

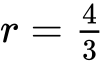
**THEN**

     ***A1***

***[4 marks]***

**14b.** *[1 mark]*

## Markscheme

     ***A1***

**Note:**     Accept answers where a candidate obtains  by finding  first. The first two marks in either method for part (a) are awarded for the same ideas and the third mark is awarded for attempting to solve an equation in .

***[1 mark]***

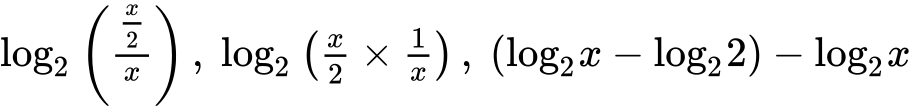
**15a.** *[4 marks]*

## Markscheme

evidence of subtracting two terms (in any order)     ***(M1)***

*eg*

correct application of the properties of logs     ***(A1)***

*eg*

correct working     ***(A1)***

*eg*

    ***A1     N3***

***[4 marks]***

**15b.** *[2 marks]*

## Markscheme

correct substitution into the formula for the sum of an arithmetic sequence     ***(A1)***

*eg*

correct working     ***A1***

*eg*

    ***AG     N0***

***[2 marks]***

**16a.** *[3 marks]*

## Markscheme

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

    ***(M1)(A1)***

**Note:** Award ***(M1)*** for substituted arithmetic sequence formula, ***(A1)*** for correct substitution.

    ***(A1)     (C3)***

***[3 marks]***

**16b.** *[3 marks]*

## Markscheme

    ***(M1)***

**Note:** Award ***(M1)*** for a correct substitution into arithmetic sequence formula.

Accept an equation.

    ***(A1)***

26 (times)     ***(A1)     (C3)***

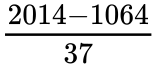
**Note:** Award the final ***(A1)*** for the correct rounding **down** of their unrounded answer.

**OR**

    ***(M1)***

**Note:** Award ***(M1)*** for a correct substitution into a linear model (where ).

Accept an equation or weak inequality.

Accept  for     ***(M1)***.

    ***(A1)***

26 (times)     ***(A1)     (C3)***

**Note:** Award the final ***(A1)*** for adding 1 to the correct rounding down of their unrounded answer.

***[3 marks]***

**17a.** *[3 marks]*

## Markscheme

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

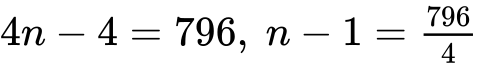
recognizing that it is an arithmetic sequence     ***(M1)***

*eg*

correct equation     ***A1***

*eg*

correct working (do not accept substituting )     ***A1***

*eg*

    ***AG     N0***

***[3 marks]***

**17b.** *[3 marks]*

## Markscheme

recognition of sum     ***(M1)***

*eg*

correct working for AP     ***(A1)***

*eg*

     ***A1     N2***

***[3 marks]***

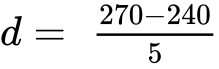
**18a.** *[2 marks]*

## Markscheme

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

        ***(M1)***

**OR**

       ***(M1)***

**Note:** Award ***(M1)*** for correct substitution into the arithmetic sequence formula.

       ***(A1) (C2)***

**18b.** *[2 marks]*

## Markscheme

       ***(M1)***

**Note:** Award ***(M1)*** for correct substitution into sum of an arithmetic sequence.

**OR**



      ***(M1)***

**Note:** Award ***(M1)*** for correct substitution into sum of an arithmetic sequence.

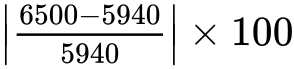
**OR**  
adding  terms consistent with their        ***(M1)***

       ***(A1)*(ft) *(C2)***

**Note:** Follow through from (a).

**18c.** *[2 marks]*

## Markscheme

       ***(M1)***

**Note:** Award ***(M1)*** for correct substitution into percentage error formula.

       ***(A1)*(ft) *(C2)***

**Note:**Follow through from (b).

**19.** *[6 marks]*

## Markscheme

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

use of either  or      ***M1***

    ***(A1)***

    ***(A1)***



attempt to solve simultaneous equations     ***M1***



    ***A1***

    ***A1***

***[6 marks]***

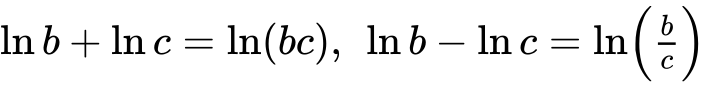
**20.** *[6 marks]*

## Markscheme

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

**Note:** There are many approaches to this question, and the steps may be done in any order. There are 3 relationships they may need to apply at some stage, for the 3rd, 4th and 5th marks. These are

equating bases *eg* recognising 9 is 

log rules: ,

exponent rule: .

The exception to the ***FT*** rule applies here, so that if they demonstrate correct application of the 3 relationships, they may be awarded the ***A*** marks, even if they have made a previous error. However all applications of a relationship need to be correct. Once an error has been made, do not award ***A1FT*** for their final answer, even if it follows from their working.

Please check working and award marks in line with the markscheme.

correct substitution into  formula     ***(A1)***

*eg*

set up equation for  in any form (seen anywhere)     ***(M1)***

*eg*

correct application of relationships     ***(A1)(A1)(A1)***

     ***A1     N3***

***[6 marks]***

**Examples of application of relationships**

**Example 1**

correct application of exponent rule for logs     ***(A1)***

*eg*

correct application of addition rule for logs     ***(A1)***

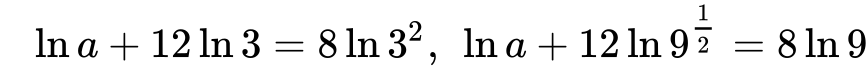
*eg*

substituting for 9 or 3 in ln expression in equation     ***(A1)***

*eg*

**Example 2**

recognising       ***(A1)***

*eg*

one correct application of exponent rule for logs relating  to      ***(A1)***

*eg*

another correct application of exponent rule for logs     ***(A1)***

*eg*

**21a.** *[3 marks]*

## Markscheme

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

(i)     (or equivalent)     ***(M1)***

**Note:** Award ***(M1)*** for **one** correct equation. Accept a list of at least 5 correct terms.

     ***(A1)***

(ii)          ***(A1)*(ft)     *(C3)***

**Note:** Follow through from (a)(i), irrespective of working shown if **OR**

**21b.** *[3 marks]*

## Markscheme

**OR**     ***(M1)(A1)*(ft)**

**Note:** Award ***(M1)*** for substituted geometric sequence formula, ***(A1)*(ft)** for their correct substitutions.

**OR**

     ***(M1)(A1)*(ft)**

**Note:**Award ***(M1)*** for a list of at least 5 consecutive terms of a geometric sequence, ***(A1)*(ft)** for terms corresponding to their answers in part (a).

     ***(A1)*(ft)     *(C3)***

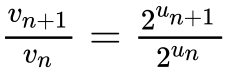
**Note:** Follow through from part (a).

**22.** *[4 marks]*

## Markscheme

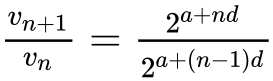
\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

(i)     **METHOD 1**

     ***M1***

     ***A1***

**METHOD 2**

     ***M1***

     ***A1***

(ii)          ***A1***

**Note:** Accept .

(iii)     **EITHER**

 is a GP with first term  and common ratio 



**OR**

 as it is an AP

**THEN**

     ***A1***

***[4 marks]***

**23a.** *[2 marks]*

## Markscheme

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

correct approach     ***(A1)***

*eg*

     ***A1     N2***

***[2 marks]***

**23b.** *[2 marks]*

## Markscheme

correct approach     ***(A1)***

*eg*, listing terms

     ***A1     N2***

***[2 marks]***

**23c.** *[2 marks]*

## Markscheme

correct approach     ***(A1)***

*eg*, listing terms, 

     ***A1     N2***

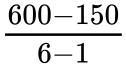
***[2 marks]***

***Total [6 marks]***

**24a.** *[2 marks]*

## Markscheme

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

     ***(M1)***

**OR**

     ***(M1)***

**Note:** Award ***(M1)*** for correct substitution into gradient formula or arithmetic sequence formula.

     ***(A1)     (C2)***

**24b.** *[1 mark]*

## Markscheme

the annual rate of growth of the number of apartments     ***(A1)     (C1)***

**Note:** Do not accept common difference.

**24c.** *[2 marks]*

## Markscheme

     ***(M1)***

**Note:** Award ***(M1)*** for correct substitution of their gradient and one of the given points into the equation of a straight line.

     ***(A1)*(ft)     *(C2)***

**Note:**Follow through from part (a).

**24d.** *[1 mark]*

## Markscheme

the initial number of apartments     ***(A1)     (C1)***

**Note:** Do not accept “first number in the sequence”.

**25a.** *[4 marks]*

## Markscheme

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

valid method for finding side length     ***(M1)***

*eg*   

correct working for area     ***(A1)***

*eg*   

 1 2 3  8  4  32 16 8

***A1A1     N2N2***

***[4 marks]***

**25b.** *[4 marks]*

## Markscheme

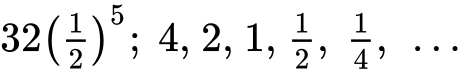
**METHOD 1**

recognize geometric progression for      ***(R1)***

eg   

    ***(A1)***

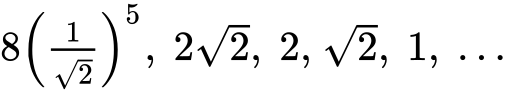
correct working     ***(A1)***

*eg*   

     ***A1     N3***

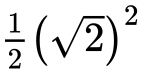
**METHOD 2**

attempt to find      ***(M1)***

*eg*   

     ***(A1)***

correct working     ***(A1)***

*eg*   

     ***A1     N3***

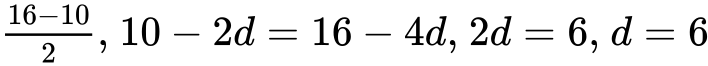
***[4 marks]***

**26a.** *[2 marks]*

## Markscheme

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

attempt to find ***(M1)***

*eg*

     ***A1     N2***

***[2 marks]***

**26b.** *[2 marks]*

## Markscheme

correct approach     ***(A1)***

*eg*     

     ***A1     N2***

***[2 marks]***

**26c.** *[3 marks]*

## Markscheme

correct substitution into sum or term formula     ***(A1)***

*eg*     

correct simplification     ***(A1)***

*eg*     

     ***A1     N2***

***[3 marks]***

Printed for SANSKAR SCHOOL

© International Baccalaureate Organization 2019

International Baccalaureate® - Baccalauréat International® - Bachillerato Internacional®