# Cp 6 Qs IB SL Maths

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

The first three terms of an arithmetic sequence are 5 , 6.7 , 8.4 .

Find the common difference.

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

The first three terms of an arithmetic sequence are 5 , 6.7 , 8.4 .

Find the 28term of the sequence.

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

The first three terms of an arithmetic sequence are  ,  ,  .

Find the sum of the first 28 terms.

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

The first term of a geometric sequence is 200 and the sum of the first four terms is 324.8.

Find the common ratio.

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

The first term of a geometric sequence is 200 and the sum of the first four terms is 324.8.

Find the tenth term.

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

The first three terms of an arithmetic sequence are 36, 40, 44,….

(i) Write down the value of *d* .

(ii) Find  .

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

(i) Show that  .

(ii) Hence, write down the value of  .

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

Consider an infinite geometric sequence with  and .

(i) Find  .

(ii) Find the sum of the infinite sequence.

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

Consider an arithmetic sequence with *n* terms, with first term () and eighth term () .

(i) Find the common difference.

(ii) Show that  .

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

The sum of the infinite geometric sequence is equal to twice the sum of the arithmetic sequence. Find *n* .

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

In an arithmetic sequence,  and  .

Find *d* .

**5b.** *[2 marks]*

Find  .

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

Find  .

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

An arithmetic sequence is given by , , , ….

(a) Write down the value of  .

(b) Find

(i)  ;

(ii)  .

(c) Given that  , find the value of  .

**6b.** *[1 mark]*

Write down the value of  .

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

Find

(i)  ;

(ii)  .

**6d.** *[2 marks]*

Given that  , find the value of  .

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

The sum of the first three terms of a geometric sequence is , and the sum of the infinite sequence is . Find the common ratio.

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

In an arithmetic sequence, the third term is 10 and the fifth term is 16.

Find the common difference.

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

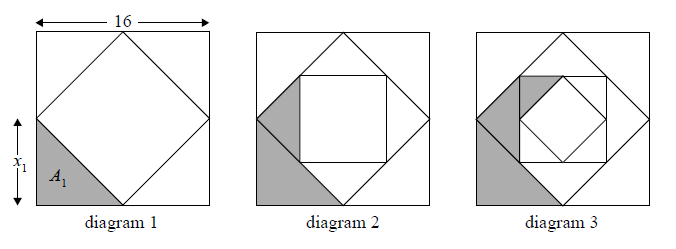
Find the first term.

**8c.** *[3 marks]*

Find the sum of the first 20 terms of the sequence.

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

The sides of a square are 16 cm in length. The midpoints of the sides of this square are joined to form a new square and four triangles (diagram 1). The process is repeated twice, as shown in diagrams 2 and 3.



Let  denote the length of one of the equal sides of each new triangle.

Let  denote the area of each new triangle.

The following table gives the values of  and , for . **Copy** and complete the table. *(Do* ***not*** *write on this page.)*

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1 | 2 | 3 |
|  | 8 |  | 4 |
|  | 32 | 16 |  |

**9b.** *[4 marks]*

The process described above is repeated. Find .

**9c.** *[7 marks]*

Consider an initial square of side length . The process described above is repeated indefinitely. The total area of the shaded regions is . Find the value of .

**10a.** *[4 marks]*

The sums of the terms of a sequence follow the pattern



Given that , find  and .

**10b.** *[4 marks]*

Find a general expression for .

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

The first three terms of a infinite geometric sequence are , where .

Write down an expression for the common ratio, .

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

Hence, show that  satisfies the equation .

**11c.** *[3 marks]*

Find the two possible values of .

**11d.** *[3 marks]*

Find the possible values of .

**11e.** *[3 marks]*

The sequence has a finite sum.

State which value of  leads to this sum **and** justify your answer.

**11f.** *[3 marks]*

The sequence has a finite sum.

Calculate the sum of the sequence.

**12a.** *[1 mark]*

Consider the infinite geometric sequence  .

Write down the 10th term of the sequence. Do not simplify your answer.

**12b.** *[4 marks]*

Consider the infinite geometric sequence  .

Find the sum of the infinite sequence.

**13a.** *[3 marks]*

Consider the arithmetic sequence  .

Find  .

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

Consider the arithmetic sequence  .

Find the value of *n* so that  .

**14a.** *[2 marks]*

Consider the infinite geometric sequence  .

Find the common ratio.

**14b.** *[2 marks]*

Find the 10th term.

**14c.** *[2 marks]*

Find the **exact** sum of the infinite sequence.

**15a.** *[6 marks]*

A city is concerned about pollution, and decides to look at the number of people using taxis. At the end of the year 2000, there were 280 taxis in the city. After *n* years the number of taxis, *T*, in the city is given by



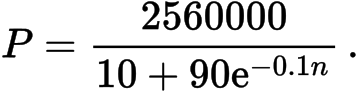
(i) Find the number of taxis in the city at the end of 2005.

(ii) Find the year in which the number of taxis is double the number of taxis there were at the end of 2000.

**15b.** *[6 marks]*

At the end of 2000 there were  people in the city who used taxis.

After *n* years the number of people, *P*, in the city who used taxis is given by



(i) Find the value of

*P*

at the end of 2005, giving your answer to the nearest whole number.

(ii) After seven complete years, will the value of *P* be double its value at the end of 2000? Justify your answer.

**15c.** *[5 marks]*

Let *R* be the ratio of the number of people using taxis in the city to the number of taxis. The city will reduce the number of taxis if  .

(i) Find the value of *R* at the end of 2000.

(ii) After how many complete years will the city first reduce the number of taxis?

**16a.** *[1 mark]*

The first three terms of an infinite geometric sequence are 32, 16 and 8.

Write down the value of *r* .

**16b.** *[2 marks]*

Find  .

**16c.** *[2 marks]*

Find the sum to infinity of this sequence.

**17.** *[6 marks]*

In an arithmetic sequence,  and  . Find the value of  and of *d* .

**18a.** *[3 marks]*

In an arithmetic series, the first term is –7 and the sum of the first 20 terms is 620.

Find the common difference.

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

Find the value of the 78th term.

**19a.** *[3 marks]*

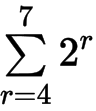
In a geometric series,  and .

Find the value of  .

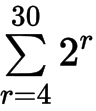
**19b.** *[4 marks]*

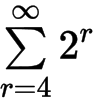
Find the smallest value of *n* for which  .

**20a.** *[1 mark]*

Expand  as the sum of four terms.

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

(i) Find the value of  .

(ii) Explain why  cannot be evaluated.

**21a.** *[1 mark]*

The *n* term of an arithmetic sequence is given by  .

Write down the common difference.

**21b.** *[5 marks]*

(i) Given that the *n* term of this sequence is 115, find the value of *n* .

(ii) For this value of *n* , find the sum of the sequence.

**22a.** *[1 mark]*

Consider the arithmetic sequence 3, 9, 15,  , 1353 .

Write down the common difference.

**22b.** *[3 marks]*

Find the number of terms in the sequence.

**22c.** *[2 marks]*

Find the sum of the sequence.

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

An arithmetic sequence,  has  and  .

Find .

**23b.** *[4 marks]*

(i) Given that  , find the value of *n* .

(ii) For this value of *n* , find  .

**24a.** *[3 marks]*

In an arithmetic series, the first term is −7 and the sum of the first 20 terms is 620.

Find the common difference.

**24b.** *[2 marks]*

Find the value of the 78 term.

**25a.** *[3 marks]*

In an arithmetic sequence  ,  and  .

Find the value of the common difference.

**25b.** *[2 marks]*

Find the value of *n* .

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# Cp 6 Qs IB SL Maths

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

## Markscheme

valid method ***(M1)***

e.g. subtracting terms, using sequence formula

***A1 N2***

***[2 marks]***

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

## Markscheme

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

e.g. 

28 term is 50.9 (exact) ***A1 N2***

***[2 marks]***

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

## Markscheme

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

e.g.  , 

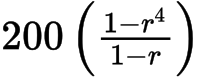
 (exact) [, ] ***A1 N2***

***[2 marks]***

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

## Markscheme

correct substitution into sum of a geometric sequence ***(A1)***

e.g.  , 

attempt to set up an equation involving a sum and 324.8 ***M1***

e.g.  , 

 (exact) ***A2 N3***

***[4 marks]***

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

## Markscheme

correct substitution into formula ***A1***

e.g. 

 (exact), ***A1 N1***

***[2 marks]***

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

The first three terms of an arithmetic sequence are 36, 40, 44,….

## Markscheme

(i) ***A1 N1***

(ii) evidence of valid approach ***(M1)***

e.g.  , repeated addition of *d* from 36

***A1 N2***

***[3 marks]***

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

## Markscheme

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

e.g.  , 

evidence of simplifying

e.g.  ***A1***

***AG N0***

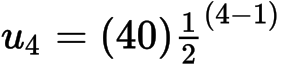
(ii) ***A1 N1***

***[3 marks]***

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

## Markscheme

(i) correct approach ***(A1)***

e.g. , listing terms

***A1 N2***

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

e.g.  , 

***A1 N2***

***[4 marks]***

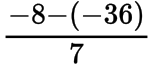
**4b.** *[5 marks]*

## Markscheme

(i) attempt to set up expression for ***(M1)***

e.g. 

correct working ***A1***

e.g.  , 

***A1 N2***

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

e.g. 

correct working ***A1***

e.g.  , 

***AG N0***

***[5 marks]***

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

## Markscheme

multiplying  (AP) by 2 or dividing *S* (infinite GP) by 2 ***(M1)***

e.g.  ,  , 40

evidence of substituting into ***A1***

e.g.  ,  ()

attempt to solve **their** quadratic (equation) ***(M1)***

e.g. intersection of graphs, formula

***A2 N3***

***[5 marks]***

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

In an arithmetic sequence,  and  .

## Markscheme

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

e.g.  , 

***A1 N2***

***[2 marks]***

**5b.** *[2 marks]*

## Markscheme

correct substitution ***(A1)***

e.g.  , 

***A1 N2***

***[2 marks]***

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

## Markscheme

correct substitution ***(A1)***

e.g.  , 

***A1 N2***

***[2 marks]***

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

An arithmetic sequence is given by , , , ….

## Markscheme

(a) ***A1 N1***

***[1 mark]***

(b) (i) correct substitution into term formula ***(A1)***

e.g.  , 

***A1 N2***

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

*eg*   , 

***A1 N2***

***[4 marks]***

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

*eg*   , 

***A1 N2***

***[2 marks]***

***Total [7 marks]***

**6b.** *[1 mark]*

## Markscheme

***A1 N1***

***[1 mark]***

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

## Markscheme

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

e.g.  , 

***A1 N2***

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

*eg*   , 

***A1 N2***

***[4 marks]***

**6d.** *[2 marks]*

## Markscheme

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

*eg*   , 

***A1 N2***

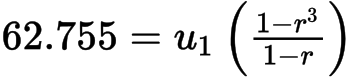
***[2 marks]***

***Total [7 marks]***

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

## Markscheme

correct substitution into sum of a geometric sequence ***A1***

*eg*   , 

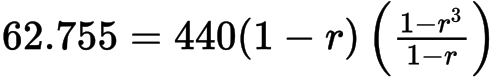
correct substitution into sum to infinity ***A1***

*eg*  

attempt to eliminate one variable  ***(M1)***

*eg* substituting 

correct equation in one variable ***(A1)***

*eg*   , 

evidence of attempting to solve the equation in a single variable ***(M1)***

*eg* sketch, setting equation equal to zero, 

***A1 N4***

***[6 marks]***

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

In an arithmetic sequence, the third term is 10 and the fifth term is 16.

## Markscheme

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

*eg* 

***A1 N2***

***[2 marks]***

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

## Markscheme

correct approach ***(A1)***

*eg* 

***A1 N2***

***[2 marks]***

**8c.** *[3 marks]*

## Markscheme

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

*eg* 

correct simplification ***(A1)***

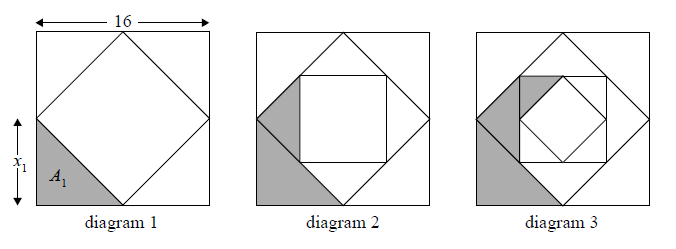
*eg* 

***A1 N2***

***[3 marks]***

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

The sides of a square are 16 cm in length. The midpoints of the sides of this square are joined to form a new square and four triangles (diagram 1). The process is repeated twice, as shown in diagrams 2 and 3.



Let  denote the length of one of the equal sides of each new triangle.

Let  denote the area of each new triangle.

## Markscheme

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]***

**9b.** *[4 marks]*

## Markscheme

**METHOD 1**

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

eg 

***(A1)***

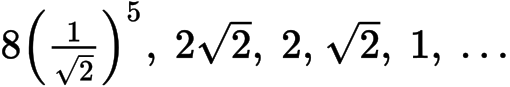
correct working ***(A1)***

*eg* 

***A1 N3***

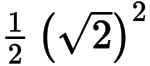
**METHOD 2**

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

*eg* 

***(A1)***

correct working ***(A1)***

*eg* 

***A1 N3***

***[4 marks]***

**9c.** *[7 marks]*

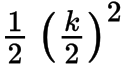
## Markscheme

**METHOD 1**

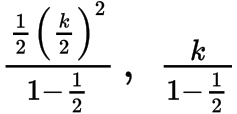
recognize infinite geometric series ***(R1)***

*eg* 

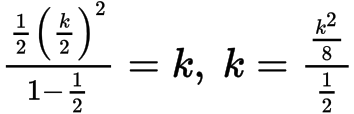
area of first triangle in terms of ***(A1)***

*eg* 

attempt to substitute into sum of infinite geometric series (must have ) ***(M1)***

*eg* 

correct equation ***A1***

*eg* 

correct working ***(A1)***

eg 

valid attempt to solve **their** quadratic ***(M1)***

eg 

***A1 N2***

**METHOD 2**

recognizing that there are four sets of infinitely shaded regions with equal area ***R1***

area of original square is ***(A1)***

so total shaded area is ***(A1)***

correct equation ***A1***

***(A1)***

valid attempt to solve their quadratic ***(M1)***

eg 

***A1 N2***

***[7 marks]***

**10a.** *[4 marks]*

The sums of the terms of a sequence follow the pattern



## Markscheme

valid method ***(M1)***

*eg* 

***A1A1A1 N4***

***[4 marks]***

**10b.** *[4 marks]*

## Markscheme

correct AP **or** GP ***(A1)***

*eg* finding common difference is , common ratio is 

valid approach using arithmetic **and** geometric formulas ***(M1)***

*eg* **and** 

***A1A1 N4***

**Note:** Award ***A1*** for , ***A1*** for .

***[4 marks]***

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

The first three terms of a infinite geometric sequence are , where .

## Markscheme

correct expression for ***A1 N1***

*eg* 

***[2 marks]***

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

## Markscheme

correct equation ***A1***

*eg* 

correct working ***(A1)***

*eg* 

correct working ***A1***

*eg* 

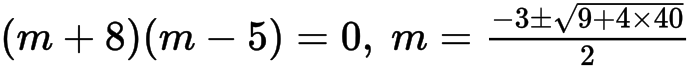
***AG N0***

***[2 marks]***

**11c.** *[3 marks]*

## Markscheme

valid attempt to solve ***(M1)***

*eg* 

***A1A1 N3***

***[3 marks]***

**11d.** *[3 marks]*

## Markscheme

attempt to substitute **any** value of  to find ***(M1)***

*eg* 

***A1A1 N3***

***[3 marks]***

**11e.** *[3 marks]*

## Markscheme

 (may be seen in justification) ***A1***

valid reason ***R1 N0***

*eg* 

**Notes:** Award ***R1*** for  only if ***A1*** awarded.

***[2 marks]***

**11f.** *[3 marks]*

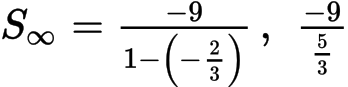
## Markscheme

finding the first term of the sequence which has  ***(A1)***

eg 

 (may be seen in formula)  ***(A1)***

correct substitution of  and their  into , as long as ***A1***

eg 

***A1 N3***

***[4 marks]***

**12a.** *[1 mark]*

## Markscheme

***A1 N1***

***[1 mark]***

**12b.** *[4 marks]*

## Markscheme

recognizing ***(A1)***

correct substitution ***A1***

e.g. 

***(A1)***

***A1 N3***

***[4 marks]***

**13a.** *[3 marks]*

## Markscheme

***(A1)***

evidence of substitution into ***(M1)***

e.g. 

***A1 N3***

***[3 marks]***

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

## Markscheme

correct approach ***(M1)***

e.g. 

correct simplification ***(A1)***

e.g.  ,  , 

***A1 N2***

***[3 marks]***

**14a.** *[2 marks]*

Consider the infinite geometric sequence  .

## Markscheme

evidence of dividing two terms ***(M1)***

e.g.  , 

***A1 N2***

***[2 marks]***

**14b.** *[2 marks]*

## Markscheme

evidence of substituting into the formula for the 10th term ***(M1)***

e.g. 

 (accept the exact value ) ***A1 N2***

***[2 marks]***

**14c.** *[2 marks]*

## Markscheme

evidence of substituting into the formula for the infinite sum ***(M1)***

e.g. 

***A1 N2***

***[2 marks]***

**15a.** *[6 marks]*

A city is concerned about pollution, and decides to look at the number of people using taxis. At the end of the year 2000, there were 280 taxis in the city. After *n* years the number of taxis, *T*, in the city is given by



## Markscheme

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



***A1 N2***

(ii) evidence of doubling ***(A1)***

e.g. 560

setting up equation ***A1***

e.g. , 

 ***(A1)***

in the year 2007 ***A1 N3***

***[6 marks]***

**15b.** *[6 marks]*

## Markscheme

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

***(A1)***

***A1 N3***

(ii) 

***A1***

not doubled ***A1 N0***

valid reason for **their** answer ***R1***

e.g. 

***[6 marks]***

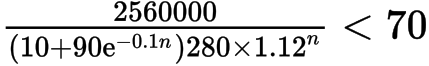
**15c.** *[5 marks]*

## Markscheme

(i) correct value ***A2 N2***

e.g.  , 91.4, 

(ii) setting up an inequality (accept an equation, or reversed inequality) ***M1***

e.g.  , 

finding the value  ***(A1)***

after 10 years ***A1 N2***

***[5 marks]***

**16a.** *[1 mark]*

The first three terms of an infinite geometric sequence are 32, 16 and 8.

## Markscheme

***A1 N1***

***[1 mark]***

**16b.** *[2 marks]*

## Markscheme

correct calculation or listing terms ***(A1)***

e.g.  ,  , 32,  4, 2, 1

***A1 N2***

***[2 marks]***

**16c.** *[2 marks]*

## Markscheme

evidence of correct substitution in ***A1***

e.g.  , 

 ***A1 N1***

***[2 marks]***

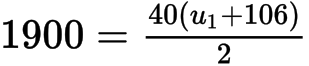
**17.** *[6 marks]*

## Markscheme

**METHOD 1**

substituting into formula for  ***(M1)***

correct substitution ***A1***

e.g. 

***A1 N2***

substituting into formula for  or ***(M1)***

correct substitution ***A1***

e.g.  , 

***A1 N2***

**METHOD 2**

substituting into formula for ***(M1)***

correct substitution ***A1***

e.g. 

substituting into formula for  ***(M1)***

correct substitution ***A1***

e.g. 

 , ***A1A1 N2N2***

***[6 marks]***

**18a.** *[3 marks]*

In an arithmetic series, the first term is –7 and the sum of the first 20 terms is 620.

## Markscheme

attempt to substitute into sum formula for AP (accept term formula) ***(M1)***

e.g.  , 

setting up correct equation using sum formula ***A1***

e.g. 

***A1 N2***

***[3 marks]***

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

## Markscheme

correct substitution ***(A1)***

= 301 ***A1 N2***

***[2 marks]***

**19a.** *[3 marks]*

In a geometric series,  and .

## Markscheme

evidence of substituting into formula for th term of GP ***(M1)***

e.g. 

setting up correct equation ***A1***

***A1 N2***

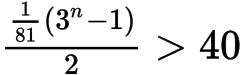
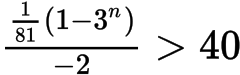
***[3 marks]***

**19b.** *[4 marks]*

## Markscheme

**METHOD 1**

setting up an inequality (accept an equation) ***M1***

e.g.  ,  , 

evidence of solving ***M1***

e.g. graph, taking logs

***(A1)***

***A1 N2***

**METHOD 2**

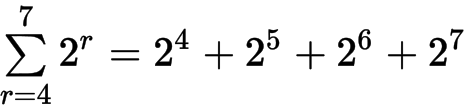
if  , sum  ; if  , sum ***A2***

(is the smallest value) ***A2 N2***

***[4 marks]***

**20a.** *[1 mark]*

## Markscheme

 (accept  )  ***A1 N1***

***[1 mark]***

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

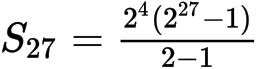
## Markscheme

(i) **METHOD 1**

recognizing a GP ***(M1)***

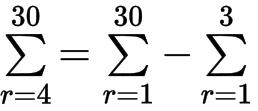
 ,  , ***(A1)***

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

e.g. 

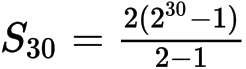
***A1 N4***

**METHOD 2**

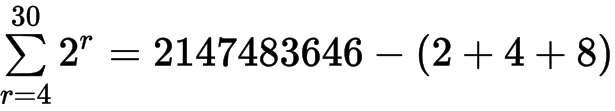
recognizing ***(M1)***

recognizing GP with  ,  , ***(A1)***

correct substitution into formula for sum

***(A1)***





 ***A1 N4***

(ii) valid reason (e.g. **infinite** GP, diverging series), **and**  (accept  ) ***R1R1 N2***

***[6 marks]***

**21a.** *[1 mark]*

The *n* term of an arithmetic sequence is given by  .

## Markscheme

***A1 N1***

***[1 mark]***

**21b.** *[5 marks]*

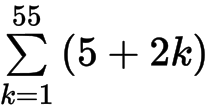
## Markscheme

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

***A1 N2***

(ii)  (may be seen in above)  ***(A1)***

correct substitution into formula for sum of arithmetic series  ***(A1)***

e.g.  ,  , 

(accept ) ***A1 N3***

***[5 marks]***

**22a.** *[1 mark]*

Consider the arithmetic sequence 3, 9, 15,  , 1353 .

## Markscheme

common difference is 6 ***A1 N1***

***[1 mark]***

**22b.** *[3 marks]*

## Markscheme

evidence of appropriate approach ***(M1)***

e.g. 

correct working ***A1***

e.g.  , 

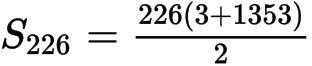
***A1 N2***

***[3 marks]***

**22c.** *[2 marks]*

## Markscheme

evidence of correct substitution ***A1***

e.g.  , 

 (accept 153000) ***A1 N1***

***[2 marks]***

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

An arithmetic sequence,  has  and  .

## Markscheme

evidence of equation for ***M1***

e.g.  ,  , 

***A1 N1***

***[2 marks]***

**23b.** *[4 marks]*

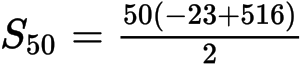
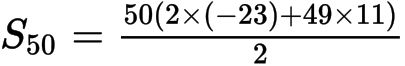
## Markscheme

(i) correct equation ***A1***

e.g.  , 

***A1 N1***

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

e.g.  , 

 (accept 12300) ***A1 N1***

***[4 marks]***

**24a.** *[3 marks]*

In an arithmetic series, the first term is −7 and the sum of the first 20 terms is 620.

## Markscheme

attempt to substitute into sum formula for AP  ***M1***

e.g.  , 

setting up correct equation using sum formula ***A1***

e.g. 

***A1 N2***

***[3 marks]***

**24b.** *[2 marks]*

## Markscheme

correct substitution ***A1***

***A1 N2***

***[2 marks]***

**25a.** *[3 marks]*

In an arithmetic sequence  ,  and  .

## Markscheme

evidence of choosing the formula for 20th term  ***(M1)***

e.g. 

correct equation ***A1***

e.g.  , 

***A1 N2***

***[3 marks]***

**25b.** *[2 marks]*

## Markscheme

correct substitution into formula for ***A1***

e.g.  , 

***A1 N1***

***[2 marks]***

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